The potential role of cessation of logging in reducing emissions from deforestation and degradation in Papua New Guinea

by

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Declaration of originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of the my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

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Statement of Ethical Conduct

The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University.

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Statement of Co-Authorship

The following people and institutions contributed to the publication of the work undertaken as part of this thesis, with contributions reported as percentages:

Chapter 2. Bryan, J.E., Shearman, P.L., Ash, J., Kirkpatrick, J.B. (2010). Estimating rainforest biomass stocks and carbon loss from deforestation and degradation in Papua New Guinea 1972–2002: Best estimates, uncertainties and research needs. *Journal of Environmental Management*. **19**, 995-1001:

Jane Bryan (Candidate) (50 %), Phil Shearman (23%), Julian Ash (13%), James Kirkpatrick (13%)

Chapter 3. Bryan, J.E., Shearman, P.L., Ash, J., Kirkpatrick, J.B (2010). The impact of a selective logging operation in Papua New Guinea on Above Ground Biomass stocks. *Ecological Applications*. 20: 2096-2103.

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Details of the Authors roles:

Phil Shearman, Julian Ash and James Kirkpatrick contributed to the idea, its formalisation and development, and with refinement and presentation.

We the undersigned agree with the above stated "proportion of work undertaken" for each of the above published (or submitted) peer-reviewed manuscripts contributing to this thesis:

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Abstract

Tropical forests are some of the most biodiverse places remaining on Earth, they provide habitat for many species, contain a rich array of plant and animal life not found elsewhere, play a role in regulating local as well as global climate and weather patterns. An estimated 6-25% of global greenhouse gas emissions arise from deforestation and degradation, primarily of tropical forests. Papua New Guinea (PNG) contains one of the largest extant areas of tropical forest in the world, and expansion of the industrial logging industry in recent decades has been the biggest driver of forest decline in that nation.

This thesis examines the impact of logging in Papua New Guinea (PNG) on forest carbon stocks, and the role that logging plays in attempts to reduce deforestation and degradation as a method of reducing global greenhouse gas emissions. All previously existing measurements from PNG which could be used to estimate carbon stocks in logged and unlogged forest were collated. The best estimate of forest carbon stocks contained in PNG's forests in 2002 was 4,770 million tonnes (Mt) (+/-13%), and the best estimate of gross forest carbon released through deforestation and degradation between 1972 and 2002 was 1,178 Mt (+/-18%). Forty-one percent of 2001 emissions resulted from logging. The large uncertainty in this estimate of carbon stocks and fluxes was primarily due to the small number and plot size of field measurements, and the lack of logging damage studies in PNG.

To address this uncertainty, additional measurement of forest carbon in logged and unlogged forests in PNG, using a plotless technique designed to capture landscape scale variation in

forest carbon and biomass, were undertaken across four different logging concessions in lowland rainforest. At Makapa concession in Western province, measured average unlogged above ground forest carbon was 111.34 +/- 2.35 tonnes per hectare (t ha^{-1}) with 34.91 +/- 2.84 t ha^{-1} killed after the first round of logging, including damage from felling, skidding and deforestation for road building. At Amanab concession in Sandaun province, average unlogged above ground forest carbon ranged from 82.25 +/- 5.2 t ha^{-1} to 108.14 +/- 3.62 t ha^{-1}, and between 27.57 +/- 2.36 t ha^{-1} and 37.66 +/- 1.80 t ha^{-1} killed after logging. At Asengseng and Mosa Laem logging concessions in West New Britain province, unlogged above ground forest carbon stocks were measured as 155.05 +/- 4.96 t ha^{-1} and 117.41+/- 4.34 t ha^{-1} respectively, with losses from logging measured as 39.97 t ha^{-1} +/- 1.85 t ha^{-1} and 47.85 +/- 2.35 t ha^{-1}. On average the first harvest removed 33% of initial forest carbon, which underestimates total logging damage as repeat harvesting within 35 years is widespread in PNG and causes additional carbon losses.

During the last decade, the logging of tropical natural forest in Brazil, Indonesia, Malaysia, Cameroon, Gabon, Central African Republic, Republic of Congo, Democratic Republic of Congo, Papua New Guinea and the Solomon Islands generated an estimated gross value at market rates of between $US 18-54 billion per year. This equates to approximately $US 6 – 87 per person per year. Government revenue generated by logging in these nations was ~$US 2.0 billion per year or ~$US 4 per person per year, with gross carbon dioxide emissions of 0.6-2.2 billion tonnes per year – equivalent to 0.5 – 2.7 times the volume produced by burning of fossil fuels in those countries. The overall value and proportion of the total value of the timber industry that is captured by the governments of these ten countries is small. The

argument that logging is vital for tropical nations to provide services to their people is not supported by these estimates.

Since reducing emissions from tropical deforestation and degradation (REDD) was first proposed as an international mechanism, the government of PNG has been embroiled in a series of forest-carbon-related scandals. Senior government officials have allegedly issued forest carbon credits for sale on international markets without legislated authority to do so, and in the case of Kamula Doso, issued forest carbon credits for sale over an area of forest allocated as a logging concession and being disputed in the courts. The scandals surrounding REDD development in PNG fits within a broader decades-long history of mismanagement of forests and the logging industry.

Logging is a major source of carbon emissions in PNG , contributes relatively little cash value compared to carbon emissions, and is an industry plagued with years of corruption and mismanagement. In addition logging contributes a relatively small amount to PNG's economy, accounting for only 5% of exports. Ceasing native forest logging in PNG would save approximately 59.90 – 92.98 million tonnes of carbon dioxide from being emitted per year. In addition, older logged forests represent a huge potential carbon sink if allowed to regenerate. Approximately 671 million tonnes of carbon dioxide could be pulled out of the atmosphere by leaving logged forests to regenerate and curtailing logging activity in PNG. This carbon sink has comparatively little economic impact on tropical populations, foregone products are easily substituted, it has been demonstrated to work if the international will exists, and is readily monitored. Importantly, unlike other options, it is eminently achievable.

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